SCHOOL OF
CIVIL ENGINEERING

INDIANA
DEPARTMENT OF TRANSPORTATION

JOINT HIGHWAY RESEARCH PROJECT

JHRP-94/1J
Final Report

MULTIMEDIA APPLICATION SYNTHESIS STUDY

Bob McCullouch

PURDUE UNIVERSITY

JOINT HIGHWAY RESEARCH PROJECT

JHRP-94/1J
Final Report

MULTIMEDIA APPLICATION SYNTHESIS STUDY

Bob McCullouch

Digitized by the Internet Archive
in 2011 with funding from
LYRASIS members and Sloan Foundation; Indiana Department of Transportation

http://www.archive.org/details/multimediaapplic00mccu

Multimedia Application Synthesis Study

by

Bob McCullouch
and
Advisory Committee Members

Walter Land
Sue Gordon
Calvin Lee
Bill Holloway
Tommy Nantung
Bob Patty
Deb Stoll
Lee Gallivan

Joint Highway Research Project
Purdue University

In cooperation with the
Indiana Department of Transportation

The opinion, findings and implementation plans expressed in this publication are those of the author and the advisory committee and not necessarily those of the Indiana Department of Transportation.

Purdue University
West Lafayette, Indiana

July 21, 1994

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.

4. Title and Subtitle	5. Report Date
Multimedia Application Synthesis Study	July 21, 1994
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Bob McCullouch	
9. Performing Organization Name and Address	10. Work Unit No.
Joint Highway Research Project Civil Engineering Building Purdue University West Lafayette, IN 47907	11. Contract or Grant No. JHRP-017
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Final Report
Indiana Department of Transportation State Office Building 100 N. Senate Ave. Indianapolis, IN 46204	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

Multimedia with its ability to involve various human faculties through the use of various media forms, provides a robust environment in which to learn in. Retention improves significantly when media exercises these various human faculties. Studies indicate that students complete training in one-third the time of the traditional instruction method while reaching up to 50 percent higher competency levels. Utilizing this technology can provide improved training tools and learning environments for the Department.

Because of the many potential applications, technical and nontechnical, that may exist within the Department for utilizing this technology; a study was performed to answer questions about the technology of multimedia and how to best utilize it. This report summarizes the work of the study committee as it came up with answers to these questions.

17. Key Words	18. Distribution Statement
Multimedia, Training, Employee Assistance, Computer	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	69	

Form DOT F 1700.7 (8-69)

Table of Contents

Introduction 1
- Work Scope 1
- Advisory Committee 1

Multimedia Applications 2
- IBM Multimedia Solutions Workshop 2
- Interactive '94 2

Multimedia Technologies 3
- Animation 3
  - Cel Animation 4
  - Tweening 4
  - Computer Animation 4
  - File Formats 4
  - Font 4
  - Frame Rates 5
  - 3-D Studio 5
- CD-ROM Interactive 5
- Text Handling 10
- Graphics 10
- Video 10
- Audio 11

Multimedia Hardware and Software 11
- Hardware 11
- Development Hardware 12
  - Ram Memory 12
  - Disk Storage 12
  - CD-ROM 12
  - CD development system 13
  - Streamer tape system 14
  - Video Camera 14
  - Other Data Storage Options 14
    - Optical Storage 14
- Potential Hardware Conflicts 15
- Software for Multimedia Programming 15
  - Authoring Tools 16
    - Card and Page Based Authoring Tools 17
    - Icon Based and Time Based Authoring Tools 17
  - Multimedia Shells 18

Multimedia Software Collection 19

INDOT Multimedia Resources . . . . . 20.

INDOT Training Needs/Multimedia Application 22
Training Needs . . . . . 22.
Training Applications and Multimedia Applicability 23

Implementation . . . . . 24. .

References . . . . . 26. .

Appendix A . . . . . 27. .

Appendix B . . . . . 51. .

Introduction

Multimedia with its ability to involve various human faculties through the use of various media forms, provides a robust environment in which to learn. Retention improves significantly when media exercises these various human faculties. Studies indicate that students complete training in one-third the time of the traditional instruction method while reaching up to 50 percent higher competency levels. Utilizing this technology can provide improved training tools and learning environments for the Department.

Because of the many potential applications, technical and nontechnical, that may exist within the Department for utilizing this technology; a study was performed to answer questions about the technology of multimedia and how to best utilize it. This report summarizes the work of the study committee as it came up with answers to these questions.

Work Scope

Specifically, the study focus of the committee is described by the following scope of work: 1. Identify how multimedia is being used in other businesses; 2. describe and explain multimedia technology with its different approaches; 3. provide information on hardware and software requirements; 4. inventory and evaluate existing INDOT resources(computer hardware) for potential use in multimedia applications; 5. study training needs and evaluate for multimedia use; and, 6. identify a list of application candidates, then evaluate and rank with approximately four (4) chosen for development.

Advisory Committee

This report is a compilation of the individual committee member efforts. Members of the committee included: Walter Land, Sue Gordon, Calvin Lee, Bill Holloway, and Tommy Nantung from INDOT; Bob McCullouch and Bob Patty from Purdue; Deb Stoll from IBM; and Lee Gallivan of FHWA.

The committee met four times. Three times for discussing, briefing and updating the work of the committee. The fourth time for discussing the final report.

Multimedia Applications

A broad survey was performed to identify various applications that have been developed. This consisted of: a general literature search performed, an appeal was made to all state DOT organizations via electronic bulletin board, Deb Stoll attended an IBM Multimedia Solutions Workshop in Atlanta, and three committee members attended Interactive '94 where applications were presented.

The electronic appeal was made over the AASHTO bulletin board service to all fifty state DOT organizations. The solicitation requested information on multimedia applications that may have been or were being developed. Six states responded and they were: Montana, Nebraska, South Dakota, New York, Vermont, and Arkansas. The only multimedia application identified was the AASHTO CAT system snow plowing application. All indicated an interest in multimedia applications and are interested in the ones being developed by INDOT. Some are interested in purchasing the applications developed by INDOT.

IBM Multimedia Solutions Workshop

The IBM Multimedia Solutions Workshop held in late March was for IBM representatives only. The purpose of the Workshop was to disseminate to the representatives involved in multimedia, application descriptions. Some applications were demonstrated as well. The goal was to foster and stimulate ideas in order to proliferate more developments in this area. Applications included: interactive training courses for employees, CD-ROM reference materials, consumer/customer information kiosks, retail sales application, smart traveler kiosk, software training, and higher education academic advising kiosks. These applications are described in a summary data sheet format found in Appendix A.

Interactive '94

Interactive '94 was a most timely and informative conference for the study. The conference contained two and a half days of sessions covering a wide range of topics from Employee performance support systems(EPSS), computer based training(CBT), multimedia hardware and software issues, and multimedia development and training issues. Three committee members attended: Sue Gordon, Tommy Nantung, and Bob McCullouch. They were able to attend 27 different session of which have been summarized and included in Appendix B of this report.

Besides the sessions, there was an exposition where hardware and software vendors displayed their products and consultants advertised their services. This provided another source of information as well as a way to ask questions and search for answers

in the study.

Applications described fell into either performance support systems or computer based training. Only a small number of applications were presented, most of the presentations were in hardware and software issues. This type of emphasis may mean that the message is technology is ready to be applied and that companies are just starting to use this technology to develop applications.

Multimedia Technologies

To describe and explain multimedia requires an understanding of the technologies that comprise it. The following sections are descriptions of these technologies.

Animation

Animation adds visual impact to a multimedia project. Most multimedia applications in both the Macintosh and Windows environment provide animation tools. Animation is possible because of a biological phenomenon known as persistence of vision. An object seen by the human eye remains mapped on the eye's retina for a brief time after viewing. This makes it possible for a series of images that are changed very slightly and very rapidly, one after the other, to seemingly blend together into a visual illusion of movement.(Vaughan, 1993) The following are different techniques that are used to create animation.

Cel Animation

The cel animation techniques made famous by Disney use a series of progressively different graphics on each frame of movie film (which plays at 24 frames per second). A minute of animation may thus require as many as 1440 separate frames. The term cel devices form the clear celluloid sheets that were used for drawing each frame, and which have been replaced today be acetate or plastic. Cel animation artwork begins with keyframes(the first and last frame of an action). When an animated figure of a man walks across the screen, he balances the weight of his entire body on one foot and then the other in a series of falls and recovers, with the opposite foot and leg catching up to support the body. Thus the first dayframe to portray a single step might be the man pitching his body weight forward off the left foot and leg, while his center of gravity shifts forward; the feet are close together and he appears to be falling. the last keyframe might be the right foot and leg catching the body's fall, with the center of gravity now centered between the outstretched stride, and the left and right feet positioned far apart.(Vaughan, 1993)

Tweening

The series of frames in between the keyframes are drawn in a process called tweening(Vaughan, 1993). To tween, you first create an object on one frame. You then place it on a different location on a second frame. This could be the next frame, or it could be a hundred frames later. The software then takes care of creating the frames in between. This animates the object between the established reference points. This is a very effective way to animate, because the software views most of the work. Tweening an action requires calculating the number of frames between keyframes and the path the action takes, and then actually sketching onto a cel with pencil the series of progressively different outlines(Vaughan, 1993). As tweening progresses, the action sequence is checked by flipping through the frames. The penciled frames are assembled and then actually filmed as a pencil test to check smoothness, continuity, and timing.(Vaughan, 1993)

Computer Animation

Computer animation proframes typically imply the same logic and procedural concepts as cel animation, using layer, keyframes, and tweening techniques, and even borrowing from the vocabulary of classic animators. On the computer, paint is most often filled or drawn with tools using features such as gradients and anti-aliasing. The word inks, in computer animation terminology, usually means special methods for computing RGB pixel values, providing edge detention, and layering so that images can blend or otherwise mix their colors to produce special transparencies, inversions, and effects.(Vaughan, 1993)

File Formats

Because only de facto animation standards exists today, there exist a demand to use editing tools that save to a format that can be efficiently shared with other applications. On the Macintosh, PICS files are perhaps the most common animation format. On PCs, the most common animation files are Macromedia's MMM format and Autodesk's FLI and FLC formats. Quick Time and AVI use their own proprietary formats.(Vaughan, 1993)

Font

Font animation in very early development of the Macintosh computer's monitor hardware; Apple chose to use a resolution of 72 pixels per inch. This matches the standard font resolution (72 points per inch) of the printing industry and allows desktop publishers and designers to actually see on the monitor what their printed output will

look like (called "What You See Is What You Get," or WYSIWYG). In addition, Apple made each pixel square-shaped, providing even measurements in all directions. Until the Macintosh was invented, and the VGA video standard for the PC, pixels were typically taller than they were wide. VGA monitor resolutions for both Macintosh 11 and Windows display 640 pixels across the screen and 480 pixels down the screen (called 640 x 480 resolution), and the pixels have an aspect ratio of 1:1 (square). The 640 x 480, square-pixel screen has become the most common for production of multimedia. This resolution also allows full-screen bitmaps created on the Macintosh platform to be easily ported to Windows, and vice versa.(Vaughan, 1993)

Frame Rates

The way animation works is the location or shape of an object changes rapidly enough so that the eye perceives the changes as motion. For the motion picture industry, the standard rate of change is 24 frames per second; for NTSC television, it is 30 frames per second. Quickly changing the viewed image is the principle for an animatic, or a flip-book. To make an object travel across the screen just change the shape and also move it a few pixels for each frame. Then, when the frames are played back at a faster speed, the changes blend together and you have motion and animation. You can usually set your own frame rates on the computer, but the rate at which changes are computed and screens are refreshed will depend upon the speed an power of the hardware. Although animations will probably never push the limits of a monitor's scan rate (about 60 to 70 frames a second), animation does put raw computing horsepower to task. If the hardware cannot compute changes and display them as a new frame on the monitor within 1/30 second, then the animation may appear jerky and slow. (Vaughan, 1993)

3-D Studio

Although animation is only a small part of what can be done with a 3-D Studio, it does it so well that it would be a serious omission to leave it out of the discussion. Its CAD-like interface and deep, complex feature set make it seem like an intimidating choice for everyday animation.

CD-ROM Interactive

CD-ROM Technology was invented by Sony and Philips. The two companies created and maintained a set of specifications for encoding and organizing forms of digital data on CDs. These specifications, known as the ***Books***, are the accepted industry foundation for interplatform compatibility. The Books are color coded. The following are the two most important standards.

Yellow Book: The yellow book format is the basis of computer-based CD-ROM, introduced in 1989. It is divided into two categories: Mode I (include the International Standard Organization 9660 and HFS) and Mode 2 (CD-ROM XA). CD-ROM XA features variable sound compression and quality levels.

Green Book: Philips developed this addition to the Yellow Book for its CD-I (Compact Disc-Interactive) format. It is a multimedia standard focused at the consumer market 's need to interleave text, sound, and video within the home entertainment systems. This standard specifies not only the data format of the CD, but the actual playback requirements. Some CD-ROM drives that claim to be CD-I compatible may in fact not be.

Some training materials in CD-I format already exist in the market. Two examples are from AASHTO (American Association of Highway and Transportation Officials) about Traffic Control and Snow Removal. For training lessons that contain mainly visual and sound with less text, the use of CD-I is encouraging. However, with a combination with readable text, this CD-I is not as good as other standards. In addition, the drawback is that the playback equipment is bulky and not commonly available, especially as portable equipment because the target from the manufacturers is the home entertainment systems.

The addition of Orange Book into the standard format occurred in 1990. This format covers writable CDs, including CD-R (CD-recordable). Although in theory the CD-R can write CD-I format, the use of CD-I in multimedia training can be a disadvantage because of the previous reasons.

How CD Interaction Works:

1. The system(PIW station - Photographic Image Writer) accepts images as film negatives or transparencies.
2. Images are scanned and digitized by the PIW.
3. Images are transferred to discs that are optimized, respectively, for image storage, presentation, enhancement, distribution, and other applications.
4. Images are displayed and manipulated on a desktop computer with a CD-ROM disk drive, or viewed on a conventional TV with a photo CD player.
5. Images are output as hard copy, written back to film, or manipulated into a multimedia process.

Hardware Necessities for a CD-ROM and an Audio Board.

1. Audio Board - Records and plays audio at a variety of rates and resolutions.

2. The CD-ROM should have a multi-session XA drive. This is necessary to

access the PIW station CD's previously written.

Writing/Making CD's

1. PIW Station - Writes an analog format of a still picture negative to a digital format on a CD and visa-versa. Available at the Purdue Center of Instructional Services department for a charge of $0.95 per disk. Each disk is capable of storing 600 MB of information (Approximately 500 images). Purchase of PIW station is $90,000 and is currently available on Suns. The PIW station was produced by KODAK and is the only machine available in the market that writes photo CD's. The company, PHILLIPS, produce other CD writing stations that primarily focus on writing text and audio to CD's.

2. Cyquest - Portable hard drive. Necessary to transport information to CIS department for the writing and producing of the CD. This drive is currently capable of storing 85 MB of information but soon, a Cyquest will be capable of 200 MB of storage.

Software Available For User Interaction and Implementation

1. Photo CD Portfolio Disc - Integration of still images, sound, and video clips for multimedia educational or sales presentations. Also provides an interactive program for image editing.

2. Pro Photo CD Master Disc - Digital generation, storage, and management of high-resolution professional images, including 4 x 5 and 120 formats.

3. Photo CD Master Disc - Digital generation, storage, and display of mid-level-resolution, 35 mm images.

4. Photo CD Catalog Disc - High-Volume digital cataloging of images.

5. KODAK Create-It Photo CD - Manipulates pictures on CD to users discretion. Write changes to the Cyquest or hard-drive for storage of altered file. The original CD cannot be changed without the PIW station.

6. KODAK Arrange-It Photo CD - Portfolio layout software that enables the user to create a productive file management system of the portfolios. The user may produce management flow charts and directories of the pictures for simplistic accessibility.

Writing a Still Picture to a CD

Method 1

The first method for writing still pictures consist of the following steps:

1. Capture the image on digital camera and store on disk.
2. Write the image to the hard drive via video capture board
3. Compress the file if necessary using a variety of software packages (e.g. JPEG - Joint Photographic Express Group)
4. Write the file that is saved on the hard drive to a CD using a number of software packages (e.g. QuickTOPIX package)
5. The CD Writer may also consist of a variety of items but the recommendation is the KODAK PCD Writer 200.
6. The images stored on the CD may be accessed in the same manner of that of the hard drive. The file can be compressed by JPEG (or any other compression technology) by a compression ratio of 30:1 but the advantage is that it will decompress the file before it arrives on the screen. The file does not need to be in its normal(decompressed) state anymore if the JPEG software package is used. The JPEG software reads only enough information into the buffer to decompress it and then transfers it to the screen. This process is repeated until the entire file is decompressed in its original state.
7. For the best results the system should be equipped with a multi-session XA drive on the CD writer. The Multi-session drive allows the user to write to a CD more than once. If the multi-session is not available the user should create a 600 MB compressed file(by JPEG) that when it is written to a CD the entire capacity of the disk will be utilized.

Method 2

The second method for writing still pictures is similar to the first except that instead of creating the image on a digital camera the negative from which the image exist will be developed. The developed image is then scanned by a color or B/W scanner and read into the hard drive in a digital format. This digital format can be written to a CD in the same manner of that presented in method 1. The scanner can read the image to the resolution of the bitmap installed in the machine. The best resolution is 24 bit and contains 16,777,216 different colors with a bright and distinctive image but a very common bitmap with a nice resolution and; 256 colors is an 8-bitmap.

Writing a Motion Picture to a CD

This method of writing motion pictures to CD is accomplished by using the same hardware described above (JPEG, QuickTOPIX software and KODAK PCD Writer 200). The same method of converting an analog format of a video to a digital format is used as described above (via a video capture board) but when motion pictures and audio writing process occurs, the file needs to be compressed. For this to work efficiently, video compression hardware and software will be needed to compress the motion picture with audio. A compressed video file still requires a large amount of storage (e.g. 1-minute of full screen high resolution video requires about 20mb.) A compressed file may be retrieved by compression software, decompressing it as its retrieved, thus creating a motion picture on the screen from a CD-ROM or CD player. This process may only occur if the platform rate at witch the CD-ROM transfers information is greater than the motion picture requirements(i.e. 30 frames/sec or 10 frames/sec). This process can be enhanced by installing multi-spin CD-ROM's with a platform rate of up to 450 KB/sec. Currently a typical single spin CD-ROM will transfer data at 150 KB/sec. This, generally, will not provide enough speed to transfer the data to the screen, thus disabling the motion picture transfer from a CD-ROM capabilities. Newer CD-ROMS, double and triple speed have transfer rates exceeding this and can play back video files.

Converting A Still Picture Negative Directly to A CD

The Photographic Image Writer(PIW) writes an analog format of a still picture negative directly to a digital format on a CD and visa-versa. Available in CIS department at Purdue University for a charge of $0.95 per disk. Each disk is capable of storing 600 MB of information (Approximately 500 images - not compressed). The actual Purchase of PIW station is $90,000. The PIW station is produced by KODAK and is the only machine available in the market that writes analog negatives directly to photo CD's. PHILLIPS produces another type of direct analog to CD station that primarily focuses on writing text and audio to CD's.

The following are the primary steps of this transformation:
1. The Photographic Writer(PIW) accepts images as film negatives or transparencies.
2. Images are scanned and digitized by the PIW.
3. Images are transferred to discs that are optimized, respectively, for image storage, presentation, enhancement, distribution, and other applications.
4. Images are displayed and manipulated on a desktop computer with a CD-ROM disc drive, or viewed on a conventional TV with a photo CD player.
5. Images are output as hard copy, written back to film, or manipulated into a multimedia process.

For more information on CD-ROM refer to Technology Edge: A guide to CD-ROM. Dana Parker & Bob Starrett - 1992.

Text Handling

Hypermedia Text Management Systems is a methodology for developing multimedia capabilities with text. Text can be linked to other text or other media data through hypermedia. These systems create text links, identifies nodes, for positioning within text index words (Vaughan, 1993).

Graphics

Graphics can be generated with a computer or read into it through a scanner. Computer generated graphics can be represented in many different file structures which is dependent on the software generating it. Most graphics are either bitmapped or vector-drawn objects. A CAD generated graphic is a typical vector-drawn object. A scanned graphic is converted into a bitmap which is a file that represents the image through individual pixels. Software exists that can convert a scanned image into a vector-drawn object.

Video

Video usage on the computer is a three step process that requires special hardware components. Typically video is captured in an analog signal format(e.g. video tape). The captured video is converted into a digital format and must be compressed so it can be stored in a reasonable size. This conversion and compression process requires a hardware device called a compression card. The second step in the process is editing the video file. This requires software which works in parallel with the video capture card. A video file can be played to the monitor in a standard Windows format(approx. 2"x2") without another hardware device. This playback option is not sufficient for most applications so a third process step is needed to playback in a larger window. This step requires a playback card which decompresses the video file and plays it and is generally combined with the capture/compression card.

Currently there are three commonly accepted standards in video cards. These are the DVI, JPEG, and MPEG standards. The DVI standard is old technology and is less expensive than the other two. DVI is the type of card that is used in the Purdue multimedia setup. JPEG and MPEG are two newer technologies with MPEG most likely emerging as the future standard. JPEG cards cost are in the $2000 range with MPEG cards are much higher, $5000 and above.

Audio

A similar process to video is used to capture and play sounds on the computer. A sound card captures, compresses, digitizes and plays a sound file. A sound clip is typically recorded through a microphone or can be from tape by utilizing adapter equipment. Sound files are play back through the card with the output coming over the speakers. Typically a sound card comes with a microphone and speakers.

There are two main formats that sound files fall into. They are MIDI(Musical Instrument Digital Interface) and WAVE (Waveform(Digital) Audio). MIDI files contain sounds of musical instruments and WAVE files are recordings of other sounds. For example background sound files are usually in MIDI format and other sound files are WAVE.

Multimedia Hardware and Software

Hardware

There are several factors that determine how well a system's hardware components are suitable for Multimedia applications. One of the key design considerations when developing a multimedia application is the program delivery or playback environment. There are various options available for selecting a full multimedia personal computer to deliver applications. The specifications for the production and delivery system should be established early in the planning stages, as the specifications will affect the production and delivery system of the application.

A multimedia hardware setup is built around a base computer with minimum features and add on components. A multimedia workstation has been assembled at Purdue and possesses a full range capability of capturing and utilizing media data. A description of this setup is provided to further explain the required features.

System Description:

486DX 66mz Personal Computer
16 MB Ram
540 MB IDE Hard Drive for program storage
17 inch VGA Monitor
1.0 GB 3.5" Hard Drive for multimedia data storage
SCSI Port Card to support SCSI Drive.
250 MB Backup Tape Drive for backup and long term storage
Sound Card with speakers and recording microphone

Action Media II Card for Video Decompression & Playback with Video Capture option board for analog to digital conversion and compression.
Color Scanner 1600 X 1600 DPI, 24 Bit

Development Hardware

Ram Memory

It is recommended that the development platform PC be equipped with 8 to 16 megabytes of RAM memory. If continuous and extensive use of video, then the upper value of 16 megabytes is needed.

Disk Storage

A large and fast storage system is not only a convenience but also a necessity for multimedia production. Still image, audio, and video files for multimedia are typically very large. Most interactive multimedia applications contain a number of these files. The disk size requirement is dependent on the type of files that will be stored and accessed. For example, a one minute video clip could require approximately 20 megabytes of storage.

CD-ROM

A critical element of the multimedia system is the CD-ROM drive speed. The NDC Marketing council's current specifications for CD-ROM drives require an average sustained data transfer rate of 150 K per second. A CD-ROM drive must also have a stereo headphone or output jack for playback of stereo CD audio at a sampling rate of 44.1 KHz and a 16 bit resolution. These specifications may not be crucial for some NVC applications, such as simple text search and retrieval software, but there are mixed media applications that can bog down slower drives. The CD-ROM, with its capability of efficiently storing up to 650 megabyte of data, is ideal for multimedia.

CD-ROM drives can either be internal or external. The internal CD-ROM is the form factor of half-height, 5 1/4" device similar to the size of the floppy drive system. When installed in a typical development system, it can be conveniently located just below the floppy drive. Some DVI boards include a Small Computer System Interface (SCSI) interface to connect to the CD-ROM drive. For an internal CD-ROM drive, a SCSI cable is run directly between the internal SCSI interface plug on top of the board and to the back of the internal CD-ROM drive.

The external CD-ROM drive system configuration is available for those development systems that either don't have the room for half-height internal CDROM drive, or prefer to the option of sharing CD-ROM drive between several computers.

For many productions, the CD-ROM drive is not required during the production process, as most of the data will be stored on a storage device. The external CD-ROM drive system allows the drive unit to be conveniently moved from computer to computer and connected when needed. The external CDROM drive's physical size is larger, due to the need to also include a power supply in its case. The internal CD-ROM drive takes its power from a cable to the power supply of application development computer.

Many developers have their applications distributed on CD-ROM. A CD-ROM has the capacity for storing over 650 megabytes of data. In order to test a prototype application hard disk of at least equal capacity is needed. The alternative, however, is to break the project in to sections on the hard drive. The individual sections can then be transferred to backup tape as they are completed. This will reduce the cost of a large hard drive but this method is not known to be convenient and the prototype project cannot be tested in its entirety. Having the hard disk approximately the same size as a CD-ROM will enable the user to prototype an application in its entirety directly from the hard disk. Most of the users like to keep more than one hard disk so that the whole project can be tested by keeping the working file in accessibility. After testing and validating, the application is transferred to the CD-ROM through a CD maker hardware device or streamer tape system. The large hard drive system typically uses an SCSI interface and requires its own SCSI controller card and software. SCSI offers the convenience of interfacing up to seven SCSI devices from one adapter card.

CD development system

The cost of CD development system has fallen in the category of desktop computer systems. There are about twenty systems available in the market, but five of them are very well known in the consumer's market. CD-R (CD-recordable) is sold through value-added resellers and system integrators, or is available as a drive with a software. There are two processes that are most commonly used. The first, is to record from the source drive i.e., local hard drive, to the CD. This system is generally referred to as "on the fly" recording. The second process is known to be better and involves creating an image file or " virtual CD " (VCD). The image file contains the data in the proper format and the exact geographical locations that files will occupy on the CD. Once the virtual CD is prepared, simulations test the performance of the structure and adjustments are made accordingly. The disk image is saved on the hard disk in VCD file format.

Streamer tape system

An archive streamer tape system is used as a low cost medium for transferring and off line storage of multimedia data files, or storing the complete application.

In this regard, system compatibility by most of the CD-ROM pressing plants for mastering the application to CD-ROM is most vital. Tape cartridges have a capacity for storing up to several gigabytes of data. The streamer tape system is also useful for periodically backing up working data from hard disk. A tape system can be used to archive working files onto a tape cartridge (Vaughan, 1993). It can also be very useful for saving the work during the production in order to facilitate reediting of the prototype. In the process of multimedia production, a system of procedures for backup storage is of paramount importance so that devastation of losing hundreds of megabytes of multimedia working files can be avoided.

Video Camera

A video camera mounted on a stand with lighting, is one of the most versatile means of image input. A camera stand is used to stabilize the camera and the image, and to provide best possible lighting conditions. The best results can be obtained by using a video camera that outputs separate and discrete Red Blue and Green signals. For camera stand video capture, the lens should include a macro mode to allow the lens and camera to be close to the subject material.

Many developers like to work with a video camera for the flexibility it offers for cropping and previewing the image to be captured. While many applications will require image capture of a large quantity of photographic prints, art work, or three dimensional objects. Treat the subject matter just as though one was photographing with a film camera, paying particular attention to the design of the lighting to fit the style and artistic direction of the application.

Other Data Storage Options

The data storage plan is an important part of the application development environment. Data files need to be accessible and with the size requirements for some, other storage options should be considered.

Optical Storage

Optical storage technology allows the recording of between 200 and 500 megabytes of data onto a removable cartridge system. The technology employs a laser like CD-ROM to record the data arranged as a series of reflective pits on the disk surface

corresponding to the computer's binary off-or on base language. Special media with a thin foil between the plastic and or glass surface is used . The higher power of the laser used in recording burns pits into the reflective foil. This burning process cannot be reversed, resulting in Write Once Read Many (WORM) technology. WORM drives continue to drop in price, and are available in the market for between $1500 to $3000. More recent improvements in optical media include recording media and technology that permit you to record, erase, and re record data on a disk cartridge.

Erasable, high capacity, magneto optical disks are available from a number of manufacturers. Because of the different interface systems, each must be individually tested with the multimedia application development system for compatibility. The magneto-optical disks store between 200 megabytes, and in some cases, over a gigabyte of data. They are a significant investment for the development system, costing over $5000. This is offset by the convenience of being able to take cartridges and individual projects off-line. There are a number of other high capacity data storage options appearing on the market. Many of these are ideal for multimedia application development. A removable cartridge system can always be used for off-line archive storage. In this case, data can be copied directly onto your hard drive for application development and production work.

Potential Hardware Conflicts

Hardware installation is of paramount importance to avoid problems at a later stage. The architecture of a personal computer is designed to work with a series of software interrupts for control of various peripheral devices. There are a total of 16 available interrupts . Some are dedicated to existing peripherals, such as hard disk drive. The layout of interrupts also has to be carefully planned when a new peripheral to a system is added. Many peripherals are shipped already configured for installation to interrupt 3. In most systems, this is typically available. This may work fine for the first device, but when another peripheral is installed, preconfigured for Interrupt 3, a conflict will result, and the system will not work.

Software utilities are available to find what interrupts are available, or to delete one if you have a potential conflict. Also, memory addressing is a potential problem area. Application Drivers require memory addressing and the mapping of this may be required for the utilization of memory.

Software for Multimedia Programming

Many application developers will elect to use an authoring environment instead of programming in a language. The tradeoff of using authoring products is the ability to

develop multimedia applications without the need for programming expertise. The authoring products available allows access to most of the capabilities of the multimedia products. Some capabilities are not available, and will require programming. Several types of authoring products are available for the multimedia application development environment. They are different, and their capabilities should be judged carefully when planning application development (Vaughan, 1993).

Visual Basic provides a programming environment that provides all the tools required to develop an application, including an editor for writing code, utilities for examining the elements of environment, and so on.

Another kind of product uses scripting. Scripting is like programming, but comparatively simpler. Multimedia ToolBook is a good example of scripting. Programming environments, authoring packages, and script based software come in all degrees of power and complexity. Any one type of product is not necessarily easier to use than another, each programming product must be judged on its own merits. Visual Basic, enables the use of the graphic interface of Windows to create an application.

ObjectVision, not a commonly used software, offers some of the same advantages as Visual Basic. C programming language and its recent variant, C++, is meant for serious programmers. The two main competitors in this field are Microsoft and Borland. Each company sells a powerful C development environment for windows (Vaughan, 1993).

Authoring Tools

Multimedia authoring tools organize and edit elements of multimedia projects, including graphics, sound, animations, and video clips. Authoring tools are used for designing interactivity and the user interface, so that various elements are made into a cohesive project. The contents and function of the project are bound together into integrated environments. The following are a few tasks an authoring tool performs

- Video productions
- Animations
- Presentations
- Interactive guided tours
- Interactive kiosk application
- Interactive training

- Simulations, prototypes, and technical visualizations

There are various kinds of authoring tools available that are categorized according to their use in sequencing and organizing multimedia elements and events. These are :

- Card or page-based tools
- Icon-based, event-driven tools
- Time-based and presentation tools

Next, these different types of authoring tools are described.

Card and Page Based Authoring Tools

In card based authoring systems, elements are organized as pages of a book or a stack of cards. The authoring system facilitates linking these pages and cards in an organized sequence. One can access to any page or card through a structured navigational pattern. Many developers arrange their images into logical sequences or groupings similar to the chapter and pages of a book, or cards in a card catalog. Navigational routines then become the directives to go to a page or card that contains appropriate images and text, and associated sounds, animations, and video clips. The page-based authoring systems are object-oriented and each object may contain a programming script which is activated when an event (such as mouse click) related to that object occurs. Most page based authoring systems provide a facility for linking objects to pages and cards.

Icon Based and Time Based Authoring Tools

In icon based tools the multimedia elements are organized in a structural framework or process. These tools simplify the organization of the project as well as display the flow diagrams for the activities. These flow diagrams becomes all the more important in long and intricate programs. Icon-based event driven tools provide a visual programming approach so as to organize and present multimedia. There are certain steps that are to be followed, starting with building a flow chart of events, tasks, and decisions by dragging appropriate icons from a library. These icons include menu choices, graphic images, sounds and computations. The flow chart graphically represents the project's logic. After the logic is represented by the flow chart, text, graphics, animation, sounds, and video movies are added. In order to refine the project, icons can be rearranged and properties having special effects can be added.

In time-based tools, elements and events are organized along a time line, with video playback rates as high as 1/30 second. Sequentially organized graphic frames can be played back at a speed set by the user. This type of tool enhances navigational and

interactive control. Visual programming is the simplest authoring process. The element's icon is dragged to the flow diagram or away to delete it. Some visual authoring tools are: Action, Authorware, IconAuthor, and Passport Producer (Vaughan, 1993). These kinds of authoring tools are the most common multimedia authoring tools. Each uses its own interface for managing events over time.

Multimedia Shells

Building a Multimedia or Computer Based Training (CBT) program can take a considerable amount of time. Based on applications explained at Interactive '94; utilizing authoring tools takes a few months up to at least two years to develop. It takes a large number of resources just to develop the user interface. The users interface is one of the two most essential parts in the multimedia programs. Of course the lessons are the most important. However, the users interface is the second most important part of the program because it provides navigation and communication to contents of the lessons.

The use of *shell* or *template* in developing a program is not new. In computer languages it is recognized as *reusable codes* that consist of main routine (as the users interface) with its subroutines. The function of the main routine is to provide navigation and communication with the subroutines. The main routine can consist of source codes or compiled source codes.

Most multimedia shells are based on one or some authoring tools, which is basically similar to the *object oriented* programming language. However, the multimedia shells are already equipped with help system, expert training templates, pre-designed training events, easy drop-in information templates, and automatic lesson flow with interaction and feedback. These shells allow developers with no computer based training (CBT) background to produce high quality CBT. Since these shells are based on one or some authoring tools that are available in the market, modification can be made if needed.

Generic multimedia shells are available in the market. At least there are four major companies that offers the shells. Their products are: World Tutor from American Airlines, LeadingWay Transaction Shells from Leading Way Technology, ExpressTrain from Princeton Center, and The Learning Processor from Pinnacle Software Corporation. In addition, most of those products offer the capability of building custom shells based on specific needs.

Based on case histories described at Interactive '94, utilizing multimedia shells can reduce development time by up to 80%. Therefore, a training manager can concentrate on the lessons itself without thinking about the navigation and communication to the

lessons. In addition, most of the shells provide learners record keeping, proficiency evaluations, and skill assessment. These features can be used for evaluation of the learning process.

Most shells provide flexible features. They are opened for modification and improvements. Most of the shells can be modified and re-compiled. Therefore, there will be no problem with lessons especially between technical and non-technical areas. The shell can be modified to make it suitable to the lessons.
In conclusion, utilizing shells is a very efficient way to develop most multimedia applications. They reduce development time but also improve the accuracy in how multimedia programs behave. The user's interface or navigation system and help system are provided which saves a considerable amount of development time. The developer concentrates on the material or data going into the application and user responses.

Multimedia Software Collection

Besides programming or authoring software used in application development, other software tools are required to capture and utilize the various types of media data to be used in an application. Software is needed for capture and playback of video and audio files, as well as capturing and editing graphical data. A collection of these software tools has been assembled for the hardware setup at Purdue, which has been described earlier in the report. The below describes a set of minimum software tools utilized for this hardware setup.

Multimedia software tools:

DOS 6.03
Windows 3.1
WordPerfect - for generating and organizing text data.
Folio Views 1.0 for Windows for:
    a. Text compression,
    b. Presentation interface
    c. Boolean search
PowerPoint - to create and/or annotate still graphics.
Calera WordScan Plus - for optical character recognition and scanning graphics.
Visual Basic - to program the graphical user interface system in the window environment.
D-Vision Basic - Video Capture and Editing Software
Norton Utilities V8.0 - to avoid fragmented disk conditions that disrupt video file playback.
PhotoFinish - to control the creation of scanned image bitmaps and to highlight

and annotate those images.

INDOT Multimedia Resources

Currently INDOT doesn't have either the hardware or software to develop or play multimedia applications. To develop applications requires hardware and software described in the section on multimedia hardware and software. INDOT is currently involved with obtaining two development stations complete with software. To play back the applications will require a PC to have video playback and sound cards and a CDROM drive since some applications will use the CD as the distribution medium. Some of the current inventory of PCs can be retrofitted with these multimedia components. Particularly the 486 machines with a minimum of 8 MB RAM. Information Services can include these requirements into new equipment requisitions and most new machines are coming standard equipped with a CDROM drive.

The below list of hardware and software illustrates the lack of resources in multimedia. If INDOT is to utilize this technology then a commitment must be made in resources, both equipment and in personnel.

INDOT Inventory of Hardware and software

Hardware:

486 w/ 8 MB RAM 212 MB hard drive OS/2	150
486 w/ 8 MB RAM 212 MB hard drive Windows 3.1	7
DEC Vax Stations 72 MB RAM 256 MB hard disk VMS operating system	86
IBM compatible 12 MB RAM 150 MB hard disk Windows 3.1	1

HP Workstations	
40 MB RAM	1
380 MB hard disk	
Unix	
40 MB RAM	1
1.3 GB hard disk	
Unix	
color scanner	1
B&W scanners	10
B&W scanner(11x17)	1
B&W scanner(36" wide)	1

Software:

PC Packages

Harvard Graphics
Pagemaker
Quatro Pro
Word Perfect
Paradox
AutoCAD
Lotus 123
Omni Page
Pathworks
CADCore Tracer

AX packages

Graphic Data Systems (GDS)
MOSS
COGO
SAS
CDA Library
WordPerfect
DecWrite
Pathworks
SoftPC
3270 TE and DecWindows
DecWindows Motif
RDB

INDOT Training Needs/Multimedia Application

Computer based training (CBT) is one of the successful applications for multimedia. CBT has proven to improve the efficiency of the training is delivered as well as its effectiveness. Because there is a natural fit for this technology in training, the committee evaluated the training needs for the Department and then evaluated them for "multimedia worthiness."

The next table of information lists training categories and their specific needs. The following table rates them for their multimedia applicability. The philosop hy in developing this was to determine the appropriateness of the application for the technology, not how the technology can be used in the application.

Training Needs

HUMAN RESOURCES

-Employee Orientation
-Employee Relations
  work rules
  how to apply progressive discipline
  grievance procedures
-Employment Process
  HRMS form

INVENTORY TRAINING INFORMATION SERVICES

-P.C. Training
-CADD/GDS
-OfficeVision
-Mainframe

CERTIFICATION PROGRAMS

-CDL
-Wastewater Treatment
-Certified Tech
-Nuclear Gauge
-Signal Tech
-Lab Tech

OTHERS

Toll Attendant
BAMS; EBS
Media Relations
Permits
Roadway Management
PE/PS workshop
Land Acquisition
Permits
Transportation Planning
Work Zone Safety
Plan Reading Course

OSHA/SAFETY

-DOT HM 126 F
-Environmental
-Hazardous Communications
-Respiratory Training
-Lockout/Tagout Training
-Confined Space Entry
-Ladder Safety
-Trenching & Excavation

MAINTENANCE

-Snow Plowing
-Trenching

Training Applications and Multimedia Applicability

Good	Fair	Poor
Transportation Planning Software Application	Bridge Inspection NHI Training	CDL
Office Vision	CES - Technical Services	Waste Water
Metrics	Nuclear Guage Training	P.C.
Permit Brochures	Certified Tech.	
INDOT Employee Orientation	Maintenance Training	
Transporting Hazardous Materials-HM 126F Orientation	Inventory Training	

Good	Fair	Poor
Employee Performance Support System	Bridge Plan Reading	
Safety Training -Hazardous Communications -Respiratory Training -Lockout/Tagout Training -Confined Space Entry		
-Ladder Safety -Trenching & Excavation M&T Quality Control		

From the above list the committee was to develop at least four recommended candidates for development. These four are to be developed on an upcoming FY95 JHRP project titled "INDOT Multimedia Applications Prototype Development." In response to this directive, the committee has come up with the following candidates that can be developed under this upcoming project.

1. Metric Training/Highway and Bridge Plan Reading
2. INDOT Orientation Training
   (Includes safety training)
3. Office Vision Training
4. Employee Performance Support System for the Design Division
   Integrated CAD System Training
5. Permit Procedures - coordinate with current revision to permit procedure process.

Implementation

The primary objective of the study was to learn more about multimedia technologies and identify current INDOT functions that can benefit through their application. An underlying philosophy guiding this objective was that it is driven by the application not the technology. Along the way in the study information was gathered about how multimedia is being used in other industries, the various technologies that makeup multimedia, hardware and software requirements, and INDOT application candidates identified. This information is provided. This report would not be complete without a discussion on what all this means for INDOT and is it applicable or appropriate.

First, it is technologically feasible and possible to develop multimedia applications. Currently INDOT is in the process of purchasing two PC multimedia development stations. With these two machines available it will be technically feasible to develop applications.

Secondly, since it is technically feasible to develop applications is it appropriate? Two general areas where most applications are developed are performance support systems and computer based training. Studying these types of applications reveals that multimedia provides a robust environment for enhancing employee performance and improving the training process.

Information services has and currently is involved in providing an integrated CAD environment for design. This can be considered as an employee performance support system for the Division of Design. This system consists of CAD, design analysis, electronic specifications, electronic design standards, and constructability information. Other tools that utilize multimedia could be added to this such as information on construction processes and techniques, or contractor equipment capabilities, or contractor materials such as standard formwork sizes.

Thirdly, since it technically feasible and appropriate how can applications be developed and distributed? A proposed Joint Highway Research Project(JHRP) titled "INDOT Multimedia Applications Prototype Development" has made the short list for funding in the current fiscal year. Through this project these proposed short candidate list applications will be developed. A research team will be organized consisting of Purdue faculty in the School of Civil Engineering and other appropriate Schools(e.g. Education), and INDOT personnel - representing training, engineering, information services, and other divisions identified by the study. This team will direct an effort to develop prototypes for each application. This development effort will consist of: 1. matching the appropriate multimedia technology with the application; 2. designing the presentation approach; 3. collecting the appropriate data content to include ; 4. testing the prototype for user reaction; and 5. releasing implementation versions. Another activity under this project is to train personnel within INDOT on how to develop and implement Multimedia applications. Transferring this expertise and having the ability to perform it internally within INDOT is the final goal of the project.

One other important implementation issue is how to distribute these applications since they require computer hardware. Three distribution approaches will be for stand-alone, local area network(LAN), and wide area network(WAN). The applications will be distributed either from a CD, which will be made by using the CD maker system at the Division of Research, or run off a storage device like a hard disk. Under this project these three approaches will be investigated and tested.

References

IBM Multimedia Solutions Workshop Proceedings, Atlanta, Georgia, March 1994.

Interactive '94 Proceedings, San Jose, California, June 6-8, 1994.

Parker, Dana and Starret, Bob, A Guide to CD-ROM, New Riders Publishing, 1992.

Vaughan, Tay, Multimedia Making it Work, Osborne McGraw Hill, 1993.

Appendix A

IBM Multimedia Solutions Workshop Summary

Training Segment

General Project Information

Client Name: Emron, Inc.

City, State: Liberty Comer, NJ

Industry: Pharmaceutical

Scope of Work

Offering name - Glaxo Managed Health Care Resource Library Introduction to Pharmacoeconomics

Offering included in multimedia services repository (Y/N) N

Application Area - Pharm. Interactive Training

Detailed Project Information

Emron provides consulting and services to clients in the Pharmaceutical and HMO industries. The course, 'Introduction to Pharmacoeconomics," is an interactive training course which was showcased in Atlanta at the Academy of Managed Care Pharmacy meeting that was held in December, 1993. Glaxo introduced the course as one of their Managed health Care Resource Library courses to receive two hours of continuing education credit. Content includes experts' input on Pharmacoeconomics. Students are quizzed to verify their progress during the course and they receive a final test to certify their successful completion. A database tracks the question responses.

Project Objectives and Results

Project objectives were to introduce a more interactive method of delivering continuing education than the traditional CBT "page turner" courses or classroom environment.

Distance Learning Segment

General Project Information

Client name:	Augusta Technical Institute
City, State:	Augusta, GA
Industry:	Technical Education

Scope of Work

Offering name - Video Distribution Network

Offering included in multimedia services repository (Y/N)

Application Area - Distance Learning/Video Monitoring

Project Objectives and Results

* Install a bi-directional video network to nine buildings on the Augusta Tech campus.
* Provide building-to-building communication and the potential to deliver off site.
* Provide distribution of cable and satellite and VCR content.

Benefits to the Customer

Provide the vehicle to test Distance Learning methods.

Education Segment

General Project Information

The project is called COFIA and it is an encyclopedia for Byzantine History. It will be distributed in CD-ROMs to schools and cultural institutions. The subject matter experts were professors of Byzantine History. The content is divided in two parts. The "free mode" and the "guided tour." In free mode there is more information, like an encyclopedia. The guided tour is extracts of that information to form several school courses. It is developed in Linkway Live! and SVGA to have the minimum base platform for schools.

Client Name:	Lainbrakis Research Foundation, the profit arm of a company that has a media empire in Greece.
City, Country:	Athens, Greece
Industry:	Culture

Scope of Work

Offering name - COFIA

Offering included in multimedia services repository (Y/N) N

Application Area - Education, Schools, Universities, Cultural Activities Organization

Project Objectives and Results

The objective was to build an interactive encyclopedia of Byzantine History, which would be used by pupils at school, teachers, students at university and professors or researchers. The result is a CD-ROM that will soon be distributed to schools to complement teacher's work.

Benefits to the Customer

It is a project for cultural activity. The academic world would benefit from an easy to use in

depth Byzantine encyclopedia.

Video Networking

General Project Information

Client Name:	Classrooms that will receive video from RISC-based server
City, State:	N/A
Industry:	Higher Education

Scope of Work

Offering Name - Video Networking in Higher Education

Offering Included in multimedia services repository (Y/N) N

Application Area - Video Servers and Networking

Project Objectives and Results

Equitable access to information (meaning text, data, voice, video, etc.) permeates issues related to reforming education, restructuring schools, establishing new standards, and developing new assessment techniques for teaching and learning. All these activities are directed at providing students with new skills to compete m an information-based global economy. They must develop abilities to critically, solve problems more analytically, and creatively and effectively communicate using more than one medium.

In order to assist in the national reforms in K-12 education, this project has been initiated. The mission of this project is to improve the quality of K-12 education for young Americans by transferring knowledge and technologies developed in the energizing world of aeronautics and space exploration to the mathematics and science learning and teaching environment. To achieve this goal the following will be included:

* Multimedia Curriculum Development
* Applied Research and Evaluation

* Teacher Education and Training
* Clearinghouse or Repository of Instructional Materials
* Consulting and Brokering

Benefits to the Customer

They will have the latest, state-of-the-art facilities and technologies to be a "showcase" where teachers and students from around the world can come to explore, learn and experience. This will establish them as one of the preeminent learning centers in the world.

Merchandising Segment

General Project Information

Client Name:	Koeck Electronics
City, State:	Vienna, Austria
Industry:	Distribution

Scope of Work

Offering name - TIP?!TAP SHOP

Offering included in multimedia services repository (Y/N) N

Application Area - Merchandising

Detailed Project Information

Comprehensive POS solution with multimedia surface (touch screens, sound and videos), product and price database with daily update, fully networked.

Project Objectives and Results

* Install "consumer/customer information kiosk" with intelligent prompting in every sales outlet.
* Allow customer to browse through different product areas, price classes and brands. Inform about product specifications and available models.
* Get enough information on consumer trends and buying patterns to inform purchasing department and industry accordingly.
* Encourage industry to absorb expenses (refinancing of project!) by preferential placement, using their logos, jingles and videos.
* Keep system up-to-date by daily and easy-to-handle updates (database, networked).
* All objectives were met to satisfaction of the customer.

Benefits to the Customer

* Multimedia solution is significant contribution to his corporate goal of "total service to customer orientation.".

* Relief for sales personnel (Multimedia station works as a "pre-information buffer" in times of peak loads. Sales people get more time for qualified consultancy.)

* More "emotional" unplanned sales, having all information available at once.

* Increased revenue overall.

Multimedia into Public Utilities Environment

General Project Information

Client name:	EPM
City, State:	Medellin, Antioquia
Industry:	Public Utilities

Scope of Work

Offering name - Multimedia into Public Utilities environment

Offering included in multimedia services repository (Y/N) N

Application Area - Invoice, Merchandise Services, Status of telephone service request.

Detailed Project Information

Connect to a Unisys Databases to show information with Multimedia application. Show information about EPM Services, services that EPM sells to their customers. Obtain a duplicate of my service's invoice just with my phone number to use it to pay my bill. Obtain information about any telephone request I had made to EPM with a number request. Teach EPM customers the best way to use their public utilities such energy, telephone and others.

Project Objectives and Results

The main objectives of this project was to penetrate the market. It was a big opportunity for us to be of Unisys client, to connect an IBM multimedia PS/2 to a Unisys machine, and share information, working with their databases and showing the information on our MM PS/2. It was a pilot, not a final application so we have not revenue. We plan to win the big business after this. Now the client has the application and they have to decide if they want to continue with us, developing the big final application, and include all of the other modules.

Benefits to the Customer

* No more long lines to solve EPM customers' requests.
* Easy and fast way to give information to the customers about their invoices.
* Sell services, use their employees in other tasks, different to attend customers' requests that the machine can solve.
* Show a new and different image to their customers; they are the first utilities company using multimedia in Colombia.

CelSearch

General Project Information

Client Name:	Warner Bros. Stores
City, State:	Burbank, California
Industry:	Entertainment

Scope of Work

Offering Name - CelSearch

Application Area - Retail Store Aid

Project Objectives and Results

The CelSearch application provides each Warner Store with a networked display system that showcases the Animation Cels which are available for sale by geographic region. Customers can look at high quality images of Cels by touching carton character or director on the screen. The salesperson can get immediate information on the Cels availability status and where it is located. The salesperson can place a Cel on hold, send a FAX of the image or make the Cel as sold. Sold images are then no longer displayed on any system.

Benefits to the Customer

The system provides two primary benefits to Warner Bros. The inventory is maintained in real time and prevents a Cel from being sold twice and also the current listings and books of copied Cels can be eliminated. In addition to the primary benefits to the company, the system helps the salesperson do his/her job by providing them a capability to find and display Cels watch are not on their wall.

Electronic Department Store

General Project Information

Client Name:	Mappin Lojas de Departmentos S.A.
City, State:	Sao Paulo, SP
Industry:	Retail

Scope of Work

Offering Name - Electronic Department Store

Offering included in multimedia repository (Y/N) N

Application Area - Retail

Project Objectives and Results

Objective: Provide a new competitive department store solution with currently available technology and having the following characteristics:

* Low operational cost:
    - reduced staff costs
    - reduced store rental fee
    - reduced energy bill/fee
    - reduced store maintenance fee
    - no inventory cost
    - no merchandise display costs
    - no damage of merchandise
    - no stilling of merchandise
* High Merchandise Availability:
    - Merchandise offering not subjected to room characteristics nor availability
    - Full merchandise mix availability
* Better Customer Service:

- Fast merchandise access
- Professional quality merchandise demonstration
- Standardized merchandise demonstration
- Reduced sales person's workload per sales transaction
- Increased sales person's availability to customer

* Simplified store operation:
  - no merchandise reposition in shelves
  - no ordering of merchandise
  - no inventory control
  - Power on / power off operation
* Easy to replicate
  - Installable in small areas
  - Installable in remote areas

Results: Fully automated department store solution with the above characteristics.

Benefits to the Customer

Fast, personal and clean service

Caltrans

General Project Information

Client name:	Caltrans
City, State:	Sacramento, CA and Los Angeles, CA
Industry:	Government, Transportation Agency

Scope of Work

Offering name - Smart Traveler Kiosk

Offering included in multimedia services repository (Y/N) N

Application Area - Transportation Alternatives: Carpooling, Public Transit and viewing freeway conditions.

Project Objectives and Results

The major goal of the Smart Traveler Kiosk project is to reduce the number of single occupancy cars in the greater Los Angeles Basin. From the main menu users may select from the following:

* View the Freeway Conditions Map
* Plan a Personalized Itinerary on Public Transit
* Find a Carpool Partner
* View Videos from Commuter Transportation Services and the Metropolitan Transit Authority.

The testing of the application so far has been successful enough for the customer to decide to deploy a network of up to 80 kiosks in response to the emergency commuting conditions in Los Angeles. After the deployment of the kiosk, extensive evaluation of its success will take place.

Benefits to the Customer

The Smart Traveler Kiosk project will help meet the goals of reducing the amount of solo commuting in Los Angeles by increasing the amount of carpooling and use of public transportation. Caltrans and the other transportation agencies view the Smart Traveler as a unique way to encourage the public to try commuting alternatives. They also view this as a positive way to enhance their image with the public. Caltrans feels that the Spanish speaking community will benefit greatly from having a bilingual kiosk.

Experience C++ A Multimedia Tutorial

General Project Information

Experience C++ is a limited-release product that has been available to customers through the IBM documentation ordering system (Mechanicsburg) and through software catalogues (Indelible Blue, Programmer's Connection, Programmer's Paradise, etc.) since January, 1994.

Scope of Work

Offering name - Experience C++ : a Multimedia Tutorial

Offering included in multimedia services repository (Y/N) N

Application Area - C++ Language instruction

Project Objectives and Results

Experience C++ had the following objectives:

* provide complete, fun to use introduction to C++ language
* use power of multimedia to describe complex topics in C++ , such as exception handling and polymorphism
* create a topic-independent framework that could be used to write multimedia tutorials on other software topics

Benefits to the Customer

* unique combination of audio, text, animation, and working code examples allows user to learn language concepts faster than conventional book. Users can run sample programs or use them as starting points for their own programs.
* tutorial applies to C++ as a language, not just to IBM C++ products. Examples work on IBM C Set + + compiler, Microsoft Visual C++ , and Borland Turbo C++ .
* once the user has completed the tutorial, she can use Experience C++ as an online reference taking advantage of the tutorial's large index and quick navigation tools.

Flooring Advisor

Scope of Work

Offering name - Flooring Advisor

Offering included in multimedia services repository (Y/N) N

Application Area - Customer Information

Detailed Project Information

Customer Y is a producer of PVC flooring and carpets. The customer sells its products through special dealers. Staff and customers should be supported by a multimedia application.

Project Objectives and Results

The objective of this project was to compile a multimedia touch screen application, which would enable Y's customers to obtain the information they required concerning a choice of flooring and how it will look in a certain room.

The Flooring Advisor will be able to show a selection of flooring within certain criteria such as color, structure, design. The customer will choose from a variety of different rooms. For example, he may be looking for a new kitchen flooring. He will then first choose from a set of images a kitchen style that is similar to that of his own kitchen. Afterwards he can select colors and designs for the flooring. The selected flooring will be shown in perspective to the kitchen.

It was important that the application should attract customers to use it and of course be easy for them to handle.

This application was presented in January '94 at a major flooring fair in Germany. It was a great success.

Benefits to the Customer

* The Flooring Advisor will be an in-house expert which is able to provide accurate and detailed information about every flooring that Y has to offer.
* Y does not need to provide product samples for each product and to each store.
* Improved information about purchase choices will lead to a more satisfied customer, therefore improving sales figures and the company's image.
* It will reduce the need for extra sales staff training on the items on offer and reduce the amount of time staff would have had to have spent with individual customers discussing design alternatives.
* With the statistic function which is incorporated into the Flooring Advisor, Y will be able to analyze the behavior of their customers when selecting flooring.

Marketing Segment

General Project Information

Client Name:	Wunderman Cato Johnson
City, State:	Woking, Hampshire, UK
Industry:	Automotive

Scope of Work

Offering name - Ford Multimedia Applications

Offering included in multimedia services repository (Y/N) N

Application Area - Marketing

Project Objectives and Results

Produce multimedia marketing applications for Auto shows.

Benefits to the Customer

Market research data captured in application. Phone hookup to marketing agency from within kiosk.

Public Access Segment

General Project Information

Client Name:	Servico Nacional de Processamento de Dados - SERPRO
City, State:	Brasilia, DF
Industry:	Federal Government

Scope of Work

Offering name - Compre Bem (Fair Buying)

Offering included in multimedia services repository (Y/N) Y

Application Area - Public Access

Detailed Project Information

This is a system intended to help the citizen to buy food by minimal prize. This has special value high inflation countries.

Project Objectives and Results

Besides the inherent social benefits, SERPRO was also displaying its logo.

Benefits to the Customer

In Brazil we have highly differentiated prices for the same products. With this system the citizen can obtain at least 15% on the total amount, while SERPRO gain is in image.

Higher Education Public Access Kiosk Segment

General Project Information

Client Name:	Sinclair Community College
City, State:	Dayton, Ohio
Industry:	Higher education

Scope of Work

OFFERING NAME - "Robo-Counselor Comes To Academic Advising" or "Sinclair InTouch"
Offering -included in multimedia services repository (Y/N) N
Application Area - Student Counseling using kiosks and Al

Project Objectives and Results

Sinclair's Intouch kiosk project was initiated during the summer of 1990 as an Artificial Intelligence(AI) project, funded in part by a grant from the State of Ohio to promote the use of AI. Sinclair formed a team of faculty, academic counselors, and computer technicians to design and prototype an expert system for automated academic advisement. The AI project was called CWEST ("Counseling With Expert Systems Technology").

After a year of prototype development, the team decided to use touch-screen kiosks to implement the software, so that the system would be easy to use, appealing, and readily accessible around campus. In December 1992, Sinclair formed a partnership with The Robinson Group Ltd. (TRG) to merge TRG's kiosk software product "InTouch" with Sinclair's advising expert systems. The software merge was accomplished during the winter and spring of 1993, and implemented at Sinclair during the summer term, 1993.

Benefits to the Customer

The students are provided information when they need it, whether a counselor is available or not. Sinclair is also saving money on printed material, which is often out-of-date long before it hits the counselor's desk. Kiosks are very convenient for the students, with six around campus today and six more on the way. With the diversity at Sinclair, the kiosk is unbiased with respect to ethnicity, gender, etc. and is non-judgmental. The students use the kiosk in short sessions and response to the student is immediate. The student has access to large volumes of data that even a counselor does not have.

Museo Del Nino

General Project Information

Client Name:	Telefones de Mexico (TELMEX)
City, State:	Mexico, D.F. (Main Site)
Industry:	Telecommunications

Scope of Work

Offering name - "MUSEO DEL NINO - MODULO DE COMUNICACIONES"

Offering included in multimedia services repository (Y/N) N

Application Area - Education/Professional Presentation

Project Objectives and Results

Provide an interactive presentation that teaches children how to access different cities ww via the area code dialing real numbers in a simulate d keyboard in a touch screen. Also, show them how the signal travels from the telephone through cables reaching either satellite or submarine fiber optic cable. This is accomplished be a switching device built by IBM that controls the light paths and also small engines that activate the rotation of the satellite and parabolic antennas.

Benefits to the Customer

Unique vendor responsible for the complete solution (HW, SW, application development, installation, etc.)

Excellent quality and response time

Pedagogical-revised interface

Very high visibility compared with other technologies

Fair price (relative to the Mexican marketplace)

Appendix B

Interactive '94 Summary

Interactive '94 - San Jose, CA June 6-8, 1994

"Professionally our methods of transmitting and reviewing the results of research are generations old and by now are totally inadequate for their purpose...Mendel's concept of the laws of genetics was lost to the world for a generation because his publication did not reach the few who were capable of grasping and extending it; and this sort of catastrophe is undoubtedly being repeated about us, as truly significant attainments become lost in the mass of the inconsequential...The summation of the human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of the square-rigged ships."

Nannevar Bush, Science advisor to President Roosevelt, 1945

Conference Summary

Interactive '94 was perhaps the most timely and informative conference we could have attended for our study. The conference contained two and a half days of sessions covering a wide range of topics from Employee performance support systems(EPSS), computer based training(CBT), multimedia hardware and software issues, and multimedia development and training issues. We were able to attend 27 different session of which we have summarized and included in this report.

Besides the sessions, there was an exposition where hardware and software vendors displayed their products and consultants advertised their services. This provided another source of information as well as a way to ask questions and search for answers in our study.

Another and perhaps the best way to obtain information was through informal networking. Several contacts were made in this sense that provided helpful information.

Conference Reflections:

1. Use a holistic approach - keep in mind that the learner is the customer and prepare them to use the technology for learning if they have never been exposed to this method. In this study one of the results should be to look at how this technology area can and should be used by INDOT. It has proven to be very effective from a learning perspective and an economical way to perform certain types of training when applied appropriately. We must not get carried away by the technology while forgetting the end user.

2. Technology is the tool to deliver the training. It can help in delivering training or performance support on time, anytime, and most anywhere. The technology is available

economically to develop some creative performance support systems as well as computer based training.

3. Use prototypes to sell the organization - tie it in to the business issues. Start with applications that lend themselves to the technology and can be developed quickly. Applications with a short development cycle can serve as prototypes for more involved and complicated ones.

4. Measure and evaluate throughout the process.

5. Standardize specifications of hardware: make sure development and delivery system platforms are compatible.

6. Initial start up costs may be high, but in the long run multimedia technology can reduce costs for training.

7. Take an evolutionary approach into this technology not a revolutionary.

8. Besides training, the performance support needs within INDOT can be candidates for this technology.

Opening Session General comments:

Anytime-Anywhere Training

The presenter talked about the availability of training courses from different "delivery methods." He introduced the concept of anytime-anywhere training. Below are the comparisons of different methods:

METHODS	AVAILABILITY
1. Classroom	Only then, only there
2. Workshop, road show or conference	Several times, several places
3. Video Disc, CBT	Business hours, as a training workshop
4. Help, EPSS	Just in time, on my desk
5. On line/off line portable	Any time, any place

In other words, there are many advantages to apply the anytime-anywhere training concept compared to other conventional training alternatives. (See classroom lists.)

The theme of this talk is to place information on-line. For example the design division, specification information, contractor material information, contractor equipment capability, and constructability information could be placed on-line providing performance support during the work flow.

Hardware faceoff: Pentium vs. PowerPC

PowerPc is produced by a consortium comprised of IBM, Apple, and Motorola. Based on information from Motorola and Intel, the Moderator concluded that the competition of the two processors will benefit the users. Intel informed that it will match the development of RISC processors while maintaining compatibility and avoid simulation modes. It means that in the near future, development of multimedia applications can be ported to the future processors because of the backward compatibility.

On the other side, Power PC is already a RISC processor that is suitable for multimedia. In addition, Power PC can run Windows programs through emulation. With the feature of Windows compatibility there is no cross-platform problems. Multimedia applications can be ported across both platforms. In short, multimedia application is less "processor-sensitive" because the two processors will "co-exist."

Which one? The bet is probably one type of machine, the PowerPC; but don't count on it.

Multimedia Development Team

A development team consists of different job categories representing a wide range of capabilities and talents. The following list represents a complete team that is capable of developing a complete multimedia application.

Project Manager - performs like a publisher/developer.
Technical Integrator - Software engineer
Systems Engineer - hardware problem solver
Graphic artists
Scan & Crop Images
2D animation
3D animation - modeling, moving objects, rendering
video director
audio
writer

Using templates for application development at American Airlines - Session # 103

This session shows the anatomy of the multimedia applications for training purposes. The anatomy of the templates for the applications (or "**shell**") is the foundation to simplify the process and to cut the development total hours in building multimedia applications. There are many (at least 5) multimedia application shells available in the market. The development of the courseware (training application) is cut dramatically. In the author experience, in 30 minutes a person that can operate a computer knows how to "feed" the courseware with data. In 30 hours that courseware developer know how to finish one hour of a training subject.

In conclusion, the shell is a tool that will be very useful to develop a courseware efficiently. (See proceeding for terms and definitions in the anatomy of a shell.)

CAN INVESTMENTS IN MULTIMEDIA REALLY BE WORTH ALL THAT MONEY?
Session # 104
Presenter: Sheldon Laube, Director of Technology
Price Waterhouse

"I will not be giving you any magic formula to figure your return on investment" was the opening comment given by the presenter. Instead, he focused on the role of multimedia in business and how it extends throughout modern organizations. Organizations are transforming from simple transaction oriented businesses to ones that need to manage knowledge. The workplace is evolving into a distributed workforce. A distributed workforce means there will exist significant travel, work will be done at multiple locations, and notebooks are the computers of the 90's. Therefore, investment into technology especially with multimedia applications will be the trend in order to manage knowledge and provide the communication links that are necessary for an organization to be successful. Firms and organizations that invest in technology will be the ones that beat the competition because they are managing the knowledge employees need whenever and wherever they are.

The Multimedia Platform Debate- Session #105

There are two development platforms to choose from. The windows or intel based platform, the Apple platform, and both with the Power PC. The following are miscellaneous comments associated with each platform.

<u>Windows</u>

Tools and typical software:
Video for Windows
Audio compression manager
WING - Animation(games)
OLE

WIN32- NT & Chicago versions
Chicago release mid '94
Daytona release fall '94
Both will have RISC capability
Plug and play capability - eliminate IRQ and memory address problems.
Windows has multimedia development assistance
Multimedium - catalog of multimedia products
Jumpstart CD - need to get more info on.

OS/2

Ultimedia tool series

Apple

Quicktime 2.0 - able to do full screen video 30 frames/sec. with software only.
Will support windows.

Develop(on MAC) ---------- Deliver(on Windows)

Learning isn't enough - it must change performance - Session # 201

Training and learning through multimedia are not new. However, to develop a multimedia application, there are still disagreements about what part of the multimedia is the most important thing and also what would we expect the outcomes of training and learning. Of course performance must be change either by training or learning or both, but how can we measure performance? Training, by time, leads to learning. Both training and learning "per say" can be measured reliably by evaluation. Multimedia grasps every aspect of training and major parts of learning. However, the outcomes in terms of performance may be measured "indirectly" not by evaluation only.

MEDIA MATCHMAKING - Session # 204

Presenters: Liz Herrick and Jim Marshall, Consultants
Andersen Consulting

Selecting the best delivery system is integral to training success. In this session, key considerations for selecting an appropriate delivery system were identified. The primary and secondary factors were discussed. The primary factors include:

Learning Objectives
Media Requirement

The secondary factors that should be considered are:

Learner Characteristics
Audience Factors
Production Factors

Using these factors, a case study was conducted to determine which media would be appropriate to conduct the training. A worksheet found in the appendix identifies the different media and which factors need to be considered for use of that delivery system.

Multimedia and Your Bottom Line - Legent Corp. Session Block #2

This session described the development effort for multimedia applications. Product development time was discussed and broken down. Development steps were provided as well as a detailed list of production steps described in a bar chart format.

Product Development time

1/3 design and development
1/3 production
1/3 validation/QC

Time - approx. - 1 month/training hour/developer person

Development steps

Design
Development
Production
Programming
Technical/Hardware Capability
Validation/QC

PC Week Panel; Authority Tool Round Up

The major players on this field are five products. They are: Icon Author, Authorware Professional, Toolbook, Quest, and CBT. This field of computer applications is very new. The products are there but the users are not as many as someone expected. For example, Icon Author and Authorware distributed, so far, about 10 thousand copies. therefore, this is a good timing for us to grab this technology and start building the applications. They are very simple to use. A user does not have to be a "computer language" expert to use the products. All of them are "icon-based" software. Hence, an ordinary computer operator can do. In the panelists

experience, a computer operator can build a simple course ware in 30 hours. However, to build a complete lesson, it will take 200 hours if the application shell is provided.

GETTING STARTED WITH PERFORMANCE SUPPORT - Session # 302

Presenter: Barry Raybould, President
Ariel PSS Corporation

According to this presenter, industry trends are moving toward employee performance support systems (EPSS). These systems enable the employee to be provided with immediate access to electronic support resources to help them perform a job with minimum support by other people. EPPS is an embedded system as opposed to a linked system which would be on-line help or documentation or an external system which includes paper documentation, instructor assistance, or phone support. The more technical key design issues were then discussed. He focused on five issues:

1. How to help users find information
2. How to handle complex information
3. Convert or Re-create?
4. How to integrate EPSS components
5. How to structure links

The appendix has copies of overheads used to detail basics of these issues. The trend of moving to EPSS has resulted in the creation of a new development methodology called performance support engineering.

Mastering your own CD-ROMS - Session #303

This computer hardware area is not explored yet by many people as a user. The main reason is the price of the CD-ROM writer. However, as the demand increased the price came down. In the last two years the price of the hardware has become affordable. The latest technology is from Yamaha with 4X (4 x 180 kB/sec) with 1/2 bay still as an internal drive in a computer. The "4X" does not mean that it will not be compatible with the existing 2X but it will only speed up the process of recording (time-wise). The requirement for the hard disk is the most important. Otherwise it will create "Buffer-Under-Run." the transfer rate should be at least 1.5 MB/second and for a 3 1/2" hard drive, it would be better to turn-off the thermal calibration, otherwise the buffer-under-run will occur. From hardware vendors point of view, recordable CD-ROM is suitable for applications in:

- making prototype CD (mastering multimedia applications for example)

- low quantity CD production
- image archiving, replacing microfiche
- data archiving, replacing nine-track tape data
- hard disk back-up
- photo CD to store images
- COM (computer output to microfiche) replacement
- security sensitive application

Hints from the presenter are:

- production more than 55 discs, give is to mastering company ($2.00 per disc using aluminum plate instead of gold)
- audio and video data should be interfaced, otherwise it will create lag-time between the readings from the disc
- frequent access files should be very close to the core/center of the disc
- stick to CD-X format for Audio Video

Digital Video compression- Mini seminar

This was a short 20 minute round table discussion on digital video compression. Various codec(COmpresion/DECompression) technologies were discussed , along with their pros and cons.

MPEG
Motion JPEG

MPEG playback board - costs approx. $350

Two factors in video compression

1. Video frame rate - 30 - 10 frames/sec.

2. Color depth and resolution - 24 bit(16 million colors) preferred option

Why multimedia? (Mini Seminar)

A study was conducted by IBM in Florida to look at the ALI (absorption & perception & interaction) of the learners of text only (manual) vs. the multimedia methods. A sample is divided in two groups; Field independent (example: trained maintenance technicians) and field dependent (example: untrained technicians). From those two groups, they are divided into Computer Novice (CN) and Computer Expert (CE). Each participant was given two treatments for "learning" purposes and was evaluated based on absorption, perception, and interaction. The

lesson is a new computer program/or new subject.

It was found that a computer novice participant from the field independent group is very sensitive to the multimedia lesson. In this case if a maintenance technician is given a lesson using multimedia, that person ability to perform will be increased almost three times. It means that if a person has already "trained" in school and asked to absorb a new lesson to be "learned" the multimedia applications, that person will likely to learn more effectively & efficiently. A table below shows the evaluation scores.

		FI	FD
TEXT ONLY	CN	69.3	15.8
	CE	300.6	241.1
TEXT & VIDEO (Multimedia)	CN	165.8	21.8
	CE	279.8	114.0

Check list for comparative features for digital video systems (Mini Seminar)

Analog video systems have 30 frames/sec for NTSC system and 25 frames/sec for PAL and SECAM systems. If we transfer the analog video to a digital video system it approximately will take 6 gigabytes for a 30 second video clip. In addition, it requires a digital data transfer rate of 44^2 MB/sec for a 24 bit color arrangement. Since a 2X CD-ROM reader can transfer only 300 KB/sec, the result will be very disappointed. Therefore a compression system should be provided to transfer the video from analog to digital.

The presenter suggested that:

- 1/4 screen size video is appropriate, then there will be not much degradation in color, transition, and motion sequence
- 30 frames/sec provide a smooth enough transition between frames
- there are some advantages and disadvantages between the two compression systems in the market (MPEG and JPEG)
- a computer in the future should have a MPEG or JPEG chips on the motherboard
- there is a MPEG software available in the market

CASE STUDY: ADOPTING A PERFORMANCE SUPPORT PERSPECTIVE - Session # SH4

Presenter: Betty Mackay, Director - Service Operations Training
IDS Financial Services

Ms. Mackay explained the process IDS used to develop a performance support system for their customer service representatives. Copies of overheads used are provided in the appendix and highlight the key points to consider throughout the process. From her explanation, there were two points that she emphasized. First, the team working on the project must communicate, be flexible, and have strong interpersonal skills. The inhibiting assumptions brought in by team members during each phase can slow down the process and team members have to be willing to work through their differences. Second, testing should involve experienced and new employees. Information presented to experienced employees is perceived differently than new employees. Testing both groups provides more accurate feedback regarding the performance after using the support system.

Software engineering Principles for the CBT Developer - Session #401

Software engineering requires more about algorithm rather than engineering itself. However, this time the presenters discussed the principles and the phases involved in developing Computer Based Training (CBT) materials.

Conventional development process should be modified to accommodate not the interactive parts but the needs analysis, outcomes, validation of the lesson, and etc. Information should also be grouped so that it does not exceed ones ability to process in the learning stage. The proceeding gives complete step-by-step in building applications in multimedia.

Taming the Video Tiger - Session #403

Abstract
This seminar presented compression fundamentals(codec) , how to film video that will compress and playback at high quality, an analysis of video capture options of real time versus step frame, the video source and its impact on quality. Also presented was benchmark clips illustrating the strengths and weakness of various codecs from Intel(Indeo), SuperMac(Cinepak), XING(Scaleable MPEG), Microsoft(Video 1 and RLE) and MediaVision(Captain Crunch).

Notes

Compression techniques : Intraframe is compression within one frame. Interframe is compression between frames.

Capture and playback at 15 frames per second is recommended.

Avoid camera panning and zooming because this causes each frame to change and affects the compression process. Use tripod while filming. Lens quality is important, BetaSP is better than HI-8.

Capture option rules:

1. Capture from highest quality source.
2. Avoid compression during capture.
3. Avoid VHS film.
4. Step frame compression - compression where frames are eliminated.
   Targa 64($1200), Videologic Captivator($350)

5. Real time - compression during capture.

Codec

Choose one based on applications. Indeo is good for talking head scenes. Cinepak/MPEG are better for high motion video. DVI is being phased out. There is a reference CD titled " Guide to Video Compression" which may be a good reference on the subject.

CONDUCTING EFFECTIVE NEEDS ANALYSIS AND WRITING WINNING EPPS PROPOSALS - Session # 408

Presenter: Alexandra Rand, President
Internal and External Communications, Inc.

Ms. Rand provided a very complete and thorough outline which emphasized key questions and statements one needs to consider when conducting a needs analysis and writing proposals. Her strategies emphasized cost justification and benefits. The cost justification should consider labor, tools, implementation, and maintenance. The benefit analysis should address individual and organizational benefits, as well as, the impact it has on the business strategies. Many good tips were also outlined when selling the proposal to management. The buy-in from upper management is important. Ideas to win their support include:

Prototype and build a simple application that conveys
the essence of what EPSS will do for the organization.

Identify other organizations that are using EPSS; determine their results to date.

Create an advisory group within your organization to investigate and guide development. Include individuals that represent key functional areas.

Invite an industry expert to present on EPSS for key members of your organization.

Keep current with new EPPS success stories and share yours with others.

Case Study - AT&T Using Full Motion Fractal Video on Laptops - Session # 503

Notes:

Fractal compression is frame by frame stepping.

Hardware bits and pieces cause a lot of problems. It is better to get your machine put together and tested from one vendor.

Fractal capture card - FutureTell($1500).
Optimagic playback card($500).

A audio card is available on the laptop that runs through the parallel port.
Novell network runs video files.

MPEG is the best technology in digital compression.

SELF-REQUESTED LEARNING: THE INTERACTIVE CHALLENGE - Session # 504

Presenter: Robert McEachnie, Manager - Technical Training
Lykes Bros., Inc.

Technology development is providing a major paradigm shift in regards to how training can be delivered to the learner. Self-requested learning is available with EPSS and multimedia applications. However, this means preparing a work force to shift their paradigm about training from instructor-led to self-requested learning. Will learners automatically accept self-requested learning? The paradigm shift from traditional training to self-requested learning may not come automatically for some. Organizations must be prepared to support the needs of the learner. Times when to consider self-requested learning would be:

-High turnover
-Learners have a high retention deficiency
-Moving from skill development to performance development

Self-requested learning applications can be used:

-on-the-job
-in learning centers
-on the desktop
-at home
-learning lab

It is important to understand when self-requested learning is appropriate and often times it is based upon the needs of the learner.

CASE STUDY: UNITED AIRLINES - DEVELOPING CONCURRENT MULTIMEDIA USING A DATABASED APPROACH - Session # 601

PANELISTS:

Michael Jackson, President
Michael Jackson Software, Inc.

Michele Manoski, Manager
United Airlines

Todd Smyth, CBT Developer
United Airlines

Mark Protus, Media Producer
Microsoft Educational Services

Panelists in this session shared information on how they developed a databased multimedia approach. This approach was developed because of the cost to change and update information. By using templates and a database driven courseware engine, individuals or small groups can work on separate parts of a project and deliver a complete and integrated product. Once templates are designed by the team, concurrent development can begin. After the courseware engine and database designs are completed, new courseware can be produced by designers without the need for programmers. Using a database engine allows for fast and easy input of course content including text, graphics, audio and video. Courseware additions, changes and updates are easily accomplished without recompiling source code. A databased strategy makes it possible for individuals without programming skills to develop courseware.

Desktop Support and Training; Develop your own Winhelp files - Session #603

This session provides an easy and inexpensive solution to support the multimedia applications, in this case, user navigation. The development process is so simple that an ordinary computer

operator can do. This program is also free of charge from Microsoft Corporation.

The proceeding explains the step-by-step approach in building a help system for Windows applications. The WHAT program from Microsoft can do a basic help system. However, to have a very sophisticated system there are some products available, like Doctor help.

Case Study - American Express-Online Documentation - Session # 605

Abstract:

This session explained how American Express converted paper-based documents to an on-line system.

On-line documentation is the full integration of information and training resources and bringing it to a computer environment.

Documents included:

job aids
glossaries
policies
procedures

System Features:

Smart Help in data analysis, error diagnosis, and error correction.
Keyword searches
Partial keyword
Scrolling capability

INDOT on-line documentation should include:

Drawing- CAD
Design standards
Specifications
Construction materials
Constructability data

Cross-platform interactive multimedia: the real issues - Session #702

It is tempting to do cross-platform development since on the other side of the "stream"

(Macintosh) is so advanced in multimedia applications. Especially in the video and audio technologies. Some authoring tools are said to be "cross-platform" compatible. In fact, they are not. The authoring tools may be compatible most of the time, but they are not truly compatibles. Some features will not work well. Audio files also might be working. However, the most difficult one is the video. Although the files can be converted but to transfer files from Macintosh to PC, there will be a degradation in almost every aspect. Macintosh has more flexibility in audio & video. In video or images 24 bit pictures will be the okay for a Mac but not for a PC. Cross-platform requires modifications in: Hardware, Software, Design, Strategy, Personnel, Development, Delivery, and Evaluation. Therefore, we have to stick to one platform and keep the analog sources of video and audio in case we need them again. If our organization is a PC environment, then build the applications in PC regardless of the outcomes in terms of quality and quantity of the applications.

In the case of main frame (UNIX) to PC or vice-versa, it is still far away that we can not see the direction. One company announced that it will be available soon, but once again, the same problem with Mac - PC will occurred.

CASE STUDY - IDS: WHAT YOUR MOTHER NEVER TOLD YOU ABOUT INTERACTIVE - Session # 703

PANELISTS:

David Flick, Team Leader
IDS Field Technology Training

Dale Newberg, Consultant
IDS Field Technology Training

Mark Ledson, Consultant
IDS Field Technology Training

John Turner, Consultant
IDS Field Technology Training

An overview was shared by the panelists in regards to how they have implemented multimedia in an organization with large, highly distributed field forces. The advantages and disadvantages of generic, slightly customized, fully customized by a vendor and fully customized in-house multimedia applications were identified. IDS has used each of these methods and has chosen to focus development efforts utilizing fully customized by a vendor. They also shared hardware recommendations and considerations. Standardizing the specifications is crucial to implementation so development and delivery systems are compatible. In addition, hardware was specifically purchased and distributed to the field forces to be solely used for training purposes.

Bridging the Gap Between Instructional Designer and CBT Programmer - Session # 706

Abstract:

One of the biggest hurdles in going to computer based training is the initial costs. One of the

ways to reduce them is to use automated storyboards as well as authoring shells. These perform all the presentations, branching, and data manipulation. The programmers simply create the "calls" or data identifiers.

General Session - 6/8

Characteristics of Learning:

The key concept here from the learner's perspective is "What is in it for me."
Focus on the learner and try to obtain a holistic approach to learning. People are the challenge to learning.

Using Animation, Graphics, Photography, and Video - Session # 802

Visuals add fun and enjoyment to learning. Try to use as much existing video as possible into the CBT. There currently exists clipart, backgrounds, soundclips that can be bought and used in these applications. Development can either be internal or external, a thorough evaluation should be performed before the decision is made. A very effective and economical playback option is the CD-ROM.

Using multimedia in technology delivered learning is very important in making the learners more comfortable with the contents delivered in the package. There is no doubt that the added value from the multimedia is high in technology lessons. Using metaphors in the multimedia applications has been recognized as an effective method in creating a more useful users interface.

This presentation provided information about how to put added value to the multimedia application by using graphics, animation, photography and full-motion video. It was found that there are some limitations in applying those technics to the PC than to that off the Macintosh. For example; 24 bit graphics or video does not cause much problem for the Mac but for the PC there should be a compromise between the parameters for the quality. The same situation also for the video, in the PC it would probably wiser to go to 15 frames/second. In short, we can not push the quality of the video or graphics without sacrificing the size, color, or the transition of the objects.

The presenters also indicated the hardware and the software needed for the applications that were shown as examples. In addition, they described the type of tools that are available and the advantages, disadvantages, and the how to solve problems related to hardware and software.

OTIS ELEVATOR COMPANY MOVING FROM TRADITIONAL TRAINING - Session

 # 806

Presenter: Charles Tweedly, Project Manager/Training Specialist
Otis Elevator Company

Otis attended Interactive '93 with only the desire to begin the transition from instructor led training to a more diverse mix of training technologies. However, since attending that conference, they are moving strongly into multimedia training. The following were main points discussed.

Identifying the technology needs of the organization
Developing vendors as a resource for change
Positioning the multimedia effort to be consistent with corporate strategy
Creating support and demand within the organization
Selling the program to Senior management
Developing prototypes so they can see the results
Keeping things going when everything comes to a screeching halt
Plan for the transition from instructor led to multimedia based.

Keys to their success have been:

Establishing a direction
Consult with vendors to learn all you can
Study concerns of Executive staff and package your message to address those concerns
Develop a few projects - Be successful with them
Take an evolutionary approach not revolutionary

COVER DESIGN BY ALDO GIORGINI